Arthur D. Little, Inc. ACORN PARK · CAMBRIDGE MASSACHUSETTS 02140 · (617) 864-5770

April 5, 1977

Dr. Julie C. Yang
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Dear Julie: C76494

As we discussed during your visit on March 11, 1977, low magnification transmission electron microscope photographs have been obtained from two representative grid pore openings of samples 22281-1 and 22281-2 to permit an estimate of the percentage of mass attributable to fibers, in particular, amphibole fibers. A previous analysis of these samples, reported on January 24, 1977, identified the presence of fibers, most of which were mineral. These results can be summarized as follows:

	Santa Ana 22281-1	Newark 22281-2
Fibers observed	104	54
Percent amphibole	6	4
Percent other mineral (mostly gypsum)	34	35
Percent ambiguous mineral	35	22
Percent amorphous (organic, glass fiber)	26	39

As some of the ambiguous mineral category may be amphibole, it is prudent to estimate a maximum amphibole fiber content of 10 percent. Due to a slightly larger fiber size, the amphibole fiber volume is about 15 percent of the total fiber volume, which corresponds to 1.6×10^{-12} cm^3 per grid pore opening.

To estimate the relative amount of fibrous material present in the samples, low magnification TEM photographs were obtained from two representative pore openings of both samples. These were assembled into

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montages, which covered entire pore openings. Particle volumes per pore opening were calculated for the two montages prepared for sample 22281-1A (exhibiting the heaviest particle loading) from the projected surface area and an estimated thickness of each particle, as follows:

0.2μm - particles showing electron beam penetration over whole area

0.5μm - particles showing electron beam penetration at edges

1-2μm - electron opaque particles

From these estimates, the ratio of fiber volume to total particle volume was estimated to be 0.04 percent (0.006 percent for amphibole fibers). For the assumption that the densities of all particles are equivalent, these percentages apply on a mass basis, as well.

From this analysis, we conclude that the amphibole fiber content, on a mass basis, corresponds to less than 0.006 percent of the supplied sample, which represented the insoluble residue fraction of a leached Monokote sample. This estimate should be reliable within a factor of two times.

Please contact me if you have any questions.

Very truly yours,

Ed

Edward T. Peters

/rdl

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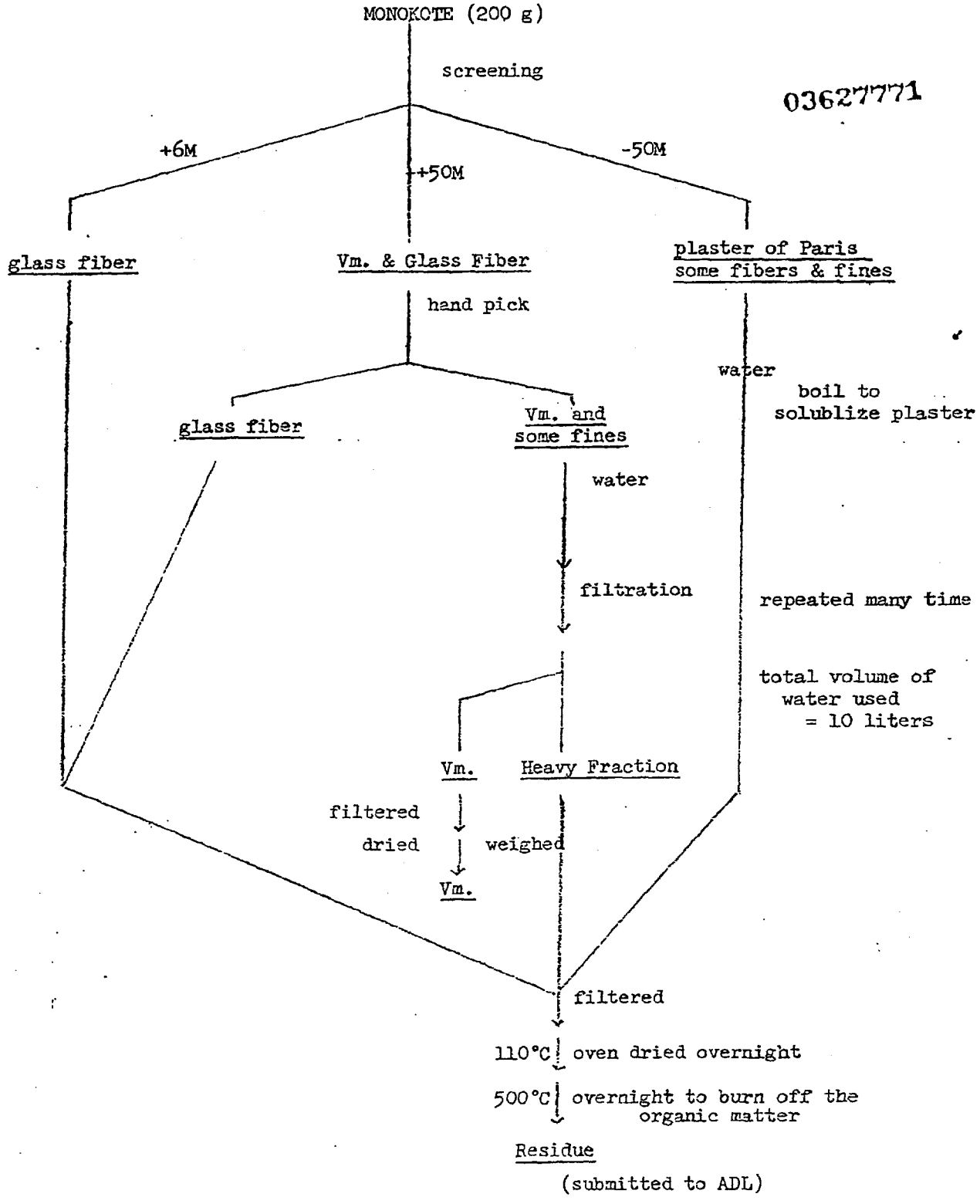
FIGURE 1 - CONCENTRATION OF FINES IN MONOKOTE®



J.C.Yang:mlr
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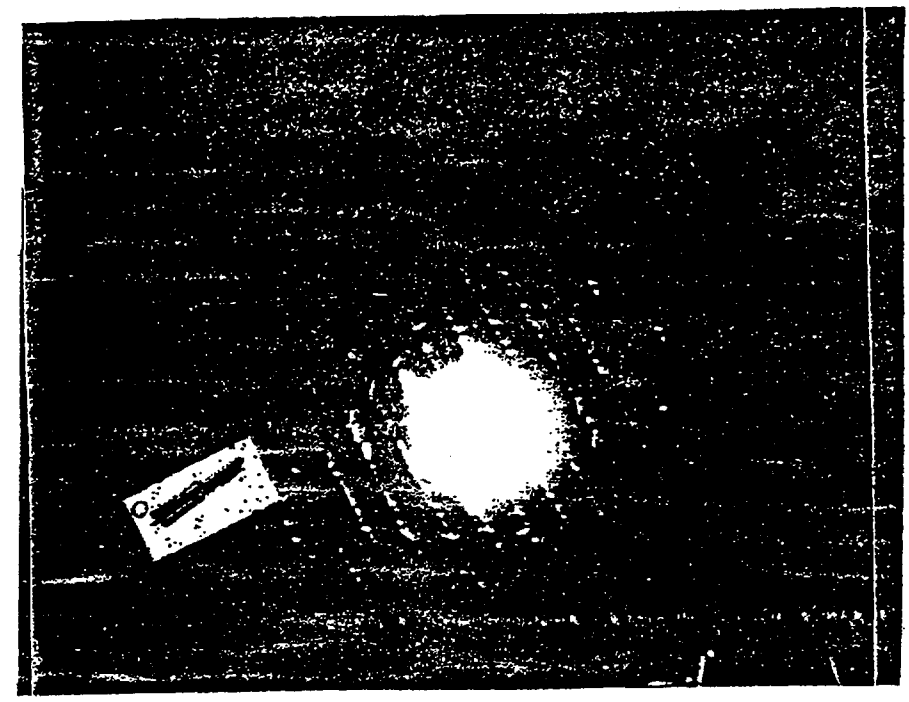

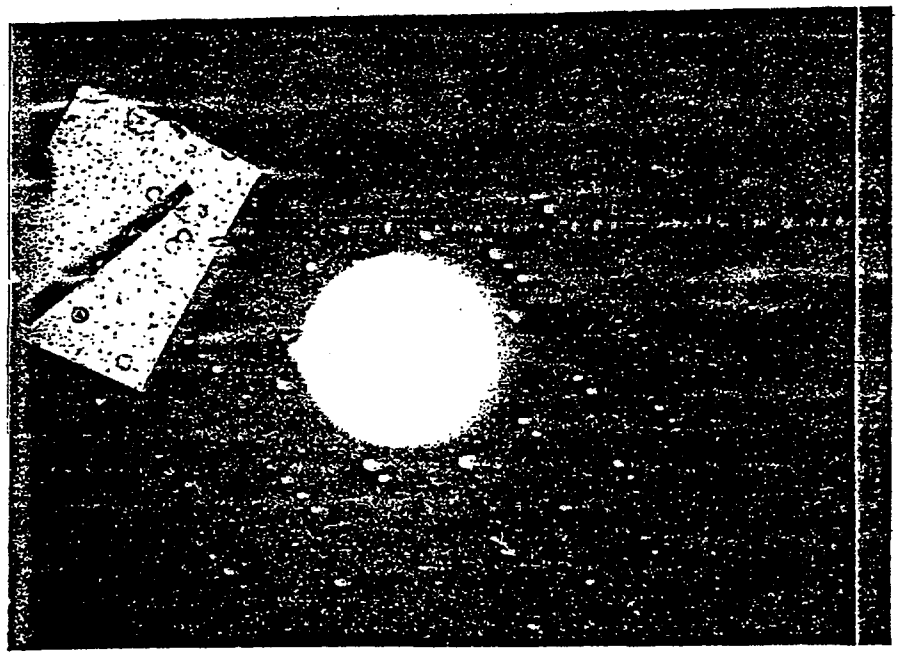

Figure 2. Transmission Electron Image of Fibrous Particles and Corresponding SAED Patterns, Sample 22281-1; 10,000x.

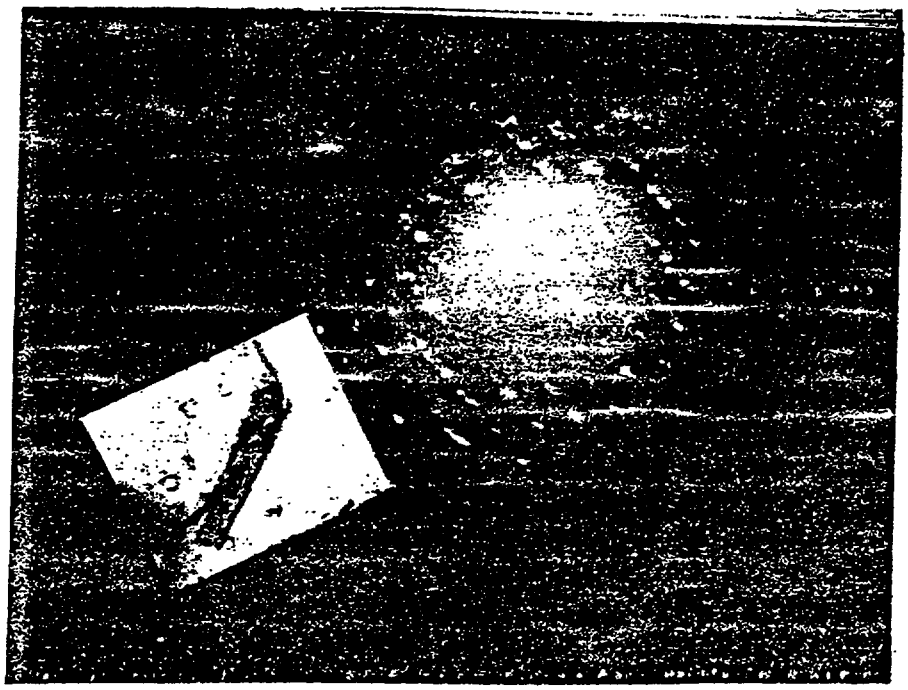

Figure 3. Transmission Electron Image of Fibrous Particles and Corresponding SAED Pattern, Sample 22281-2; 10,000x.

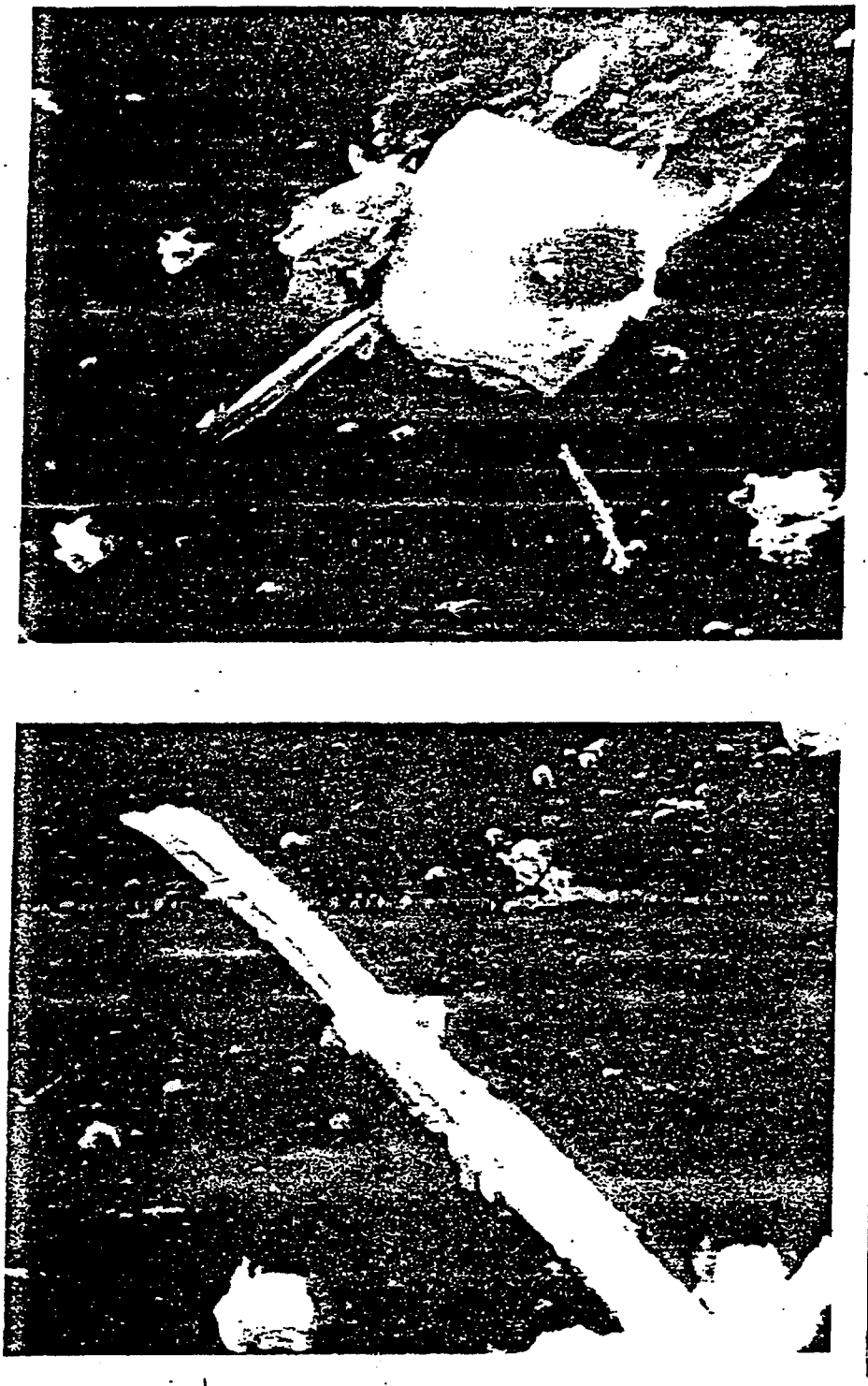

Figure 4. Scanning Electron Micrographs of Fibrous Particles in Sample 22281-1
a) 5500x, b) 5500x

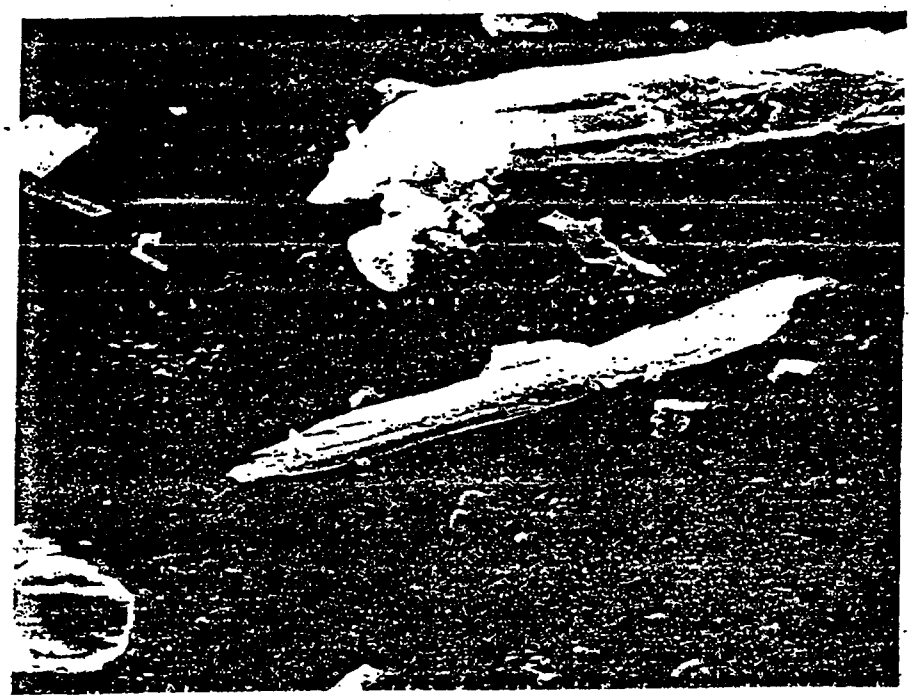

Figure 5 | Scanning Electron Micrograph of a Fibrous Particle in Sample 22281-2, 5500x.

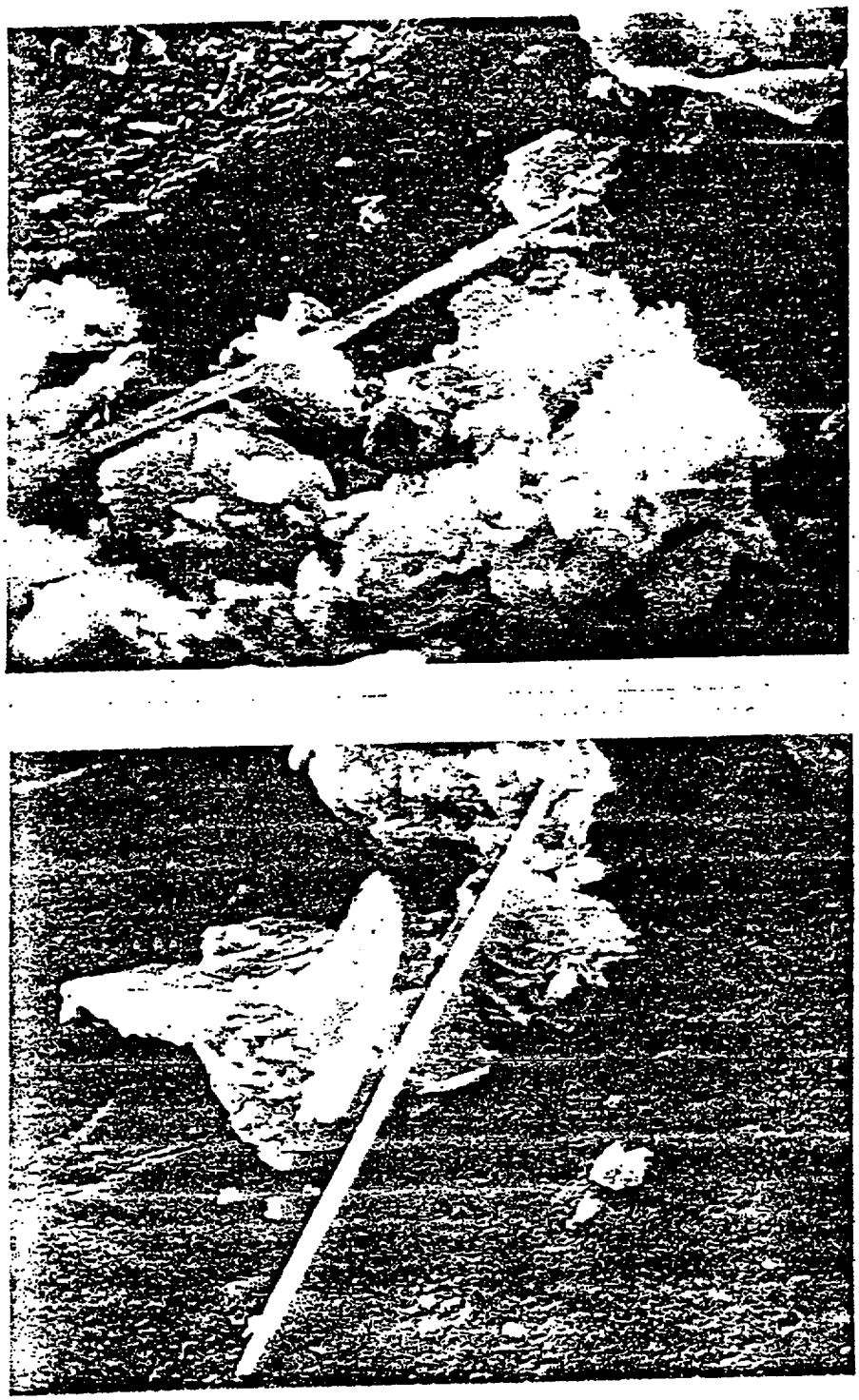

Figure 6) Scanning Electron Micrographs of Fibrous Particles in Sample 22281-1. a) 2400x, b) 1100x